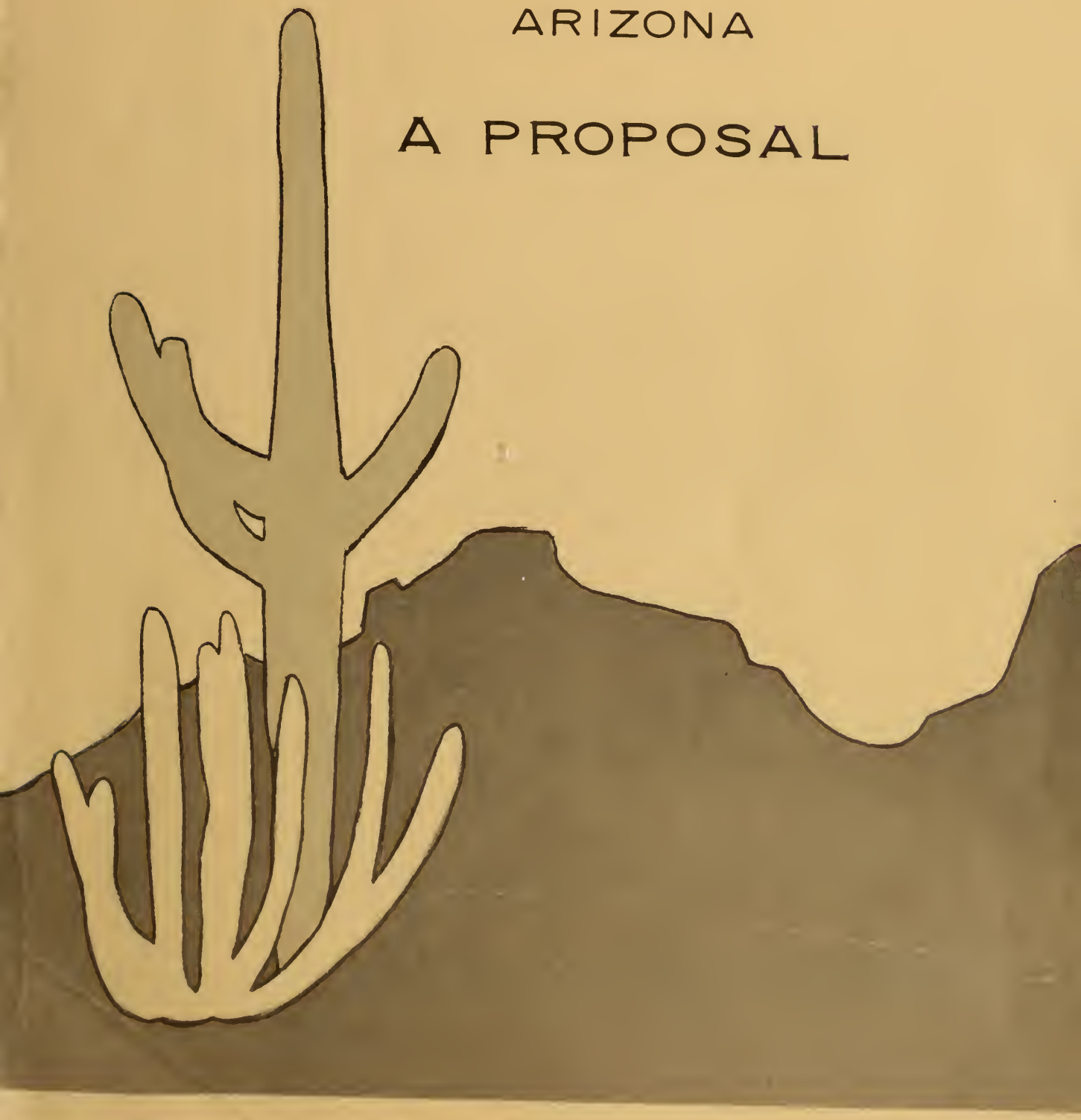
SONORAN DESERT NATIONAL PARK

ARIZONA

A PROPOSAL



UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

UNITED STATES

DEPARTMENT of the INTERIOR

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OFFICE OF THE SECRETARY

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UDALL ENDORSES PROPOSAL TO COMBINE ORGAN PIPE CACTUS NATIONAL MONUMENT AND CABEZA PRIETA GAME RANGE AS SONORAN DESERT NATIONAL PARK IN ARIZONA

Secretary of the Interior Stewart L. Udall today endorsed enthusiastically a proposal to combine Organ Pipe Cactus National Monument and Cabeza Prieta Game Range in Arizona to form the Sonoran Desert National Park. "This area would provide a national park of superlative quality," the Secretary said.

Organ Pipe Cactus National Monument and the Cabeza Prieta Game Range, which make up the major portion of the study area, represent the last sizeable expanse of relatively unspoiled Sonoran Desert remaining in the United States. The study area also includes an 80,000-acre extension west of the Game Range which contains the spectacular Tinajas Atlas Mountains. The total size of the proposed park would be approximately 1,242,000 acres, making it one of the largest in the National Park System.

In 1962, the Advisory Board on National Parks, Historic Sites, Buildings, and Monuments urged the Secretary to take positive steps to prevent further damage to the Organ Pipe Cactus National Monument from mining activities. A preliminary analysis of the mining problem indicated the need for a broader study covering also the grazing problem and a reevaluation of the purpose of the Monument.

The Sonoran Desert National Park proposal resulted from this broader study. It recommends that the establishment of the new national park be contingent upon the termination of military use of the Game Range, which now precludes public use, and the elimination of grazing and mining activities in the monument which seriously threaten the values which need to be preserved.

The report to the Secretary is based upon investigations made by National Park Service staff members of the Southwest Regional Office and Organ Pipe Cactus National Monument and by Weldon F. Heald, Departmental consultant and well-known

conservationist of Tucson, Arizona. Norman Simmons, Assistant Manager of the Cabeza Prieta Game Range for the Bureau of Sport Fisheries and Wildlife, served as guide and consultant to the group throughout its study of the Game Range.

"Copies of this study report will be given wide distribution, to permit the greatest possible number of citizens to develop informed opinions on the subject, and to let the Department of the Interior have the benefit of their thinking," Udall said.

Recognizing the great economic promise of recreation in this part of Arizona, the report describes the area as within an easy day's travel of a great segment of the Nation's population, including southern California with 10 million people and the Phoenix-Tucson area with close to one million.

The 330,874-acre Organ Pipe Cactus National Monument in southern Arizona was established in 1937 by Presidential proclamation to protect and preserve fine examples of Sonoran Desert vegetation--especially the organ pipe and senita cactus--plus wildlife and the desert scenery.

The adjoining Cabeza Prieta Game Range--about 860,000 acres--is an area larger than the State of Rhode Island without a single permanent human inhabitant. Administered by Interior's Bureau of Sport Fisheries and Wildlife, the Game Range was established in 1939, primarily for the protection of desert bighorn sheep. It also provides an undisturbed habitat for a remnant population of pronghorn (antelope), the collared peccary (wild pig), Gambels quail and white-winged dove.

The Refuge gets its name from lava-capped Cabeza Prieta ("dark head") Peak, 2,650 feet high near the south end. The dappled, pinto-like combination of brown volcanic rock superimposed on gleaming white granite is a spectacular feature of these mountains. Natural rock basins called "tinajas," or "tanks," scooped out by centuries of violent but infrequent cloudbursts, provide drinking water for wildlife. These tinajas have been life savers to desert travelers for nearly 400 years.

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SONORAN DESERT NATIONAL PARK

ARIZONA

A PROPOSAL

A Study of the National Park Potential of
Organ Pipe Cactus National Monument
and the
Cabeza Prieta Game Range
and
An Analysis of Adverse Uses

United States
Department of the Interior

National Park Service
Southwest Region

May 1965

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INTRODUCTION

Background and Purpose of Study

Because of its outstanding scientific, scenic, and recreational values, there is strong sentiment among conservationists in Arizona and throughout the country to achieve certain goals for Organ Pipe Cactus National Monument. There is general agreement that (1) the Monument should be enlarged to include important features of the Sonoran Desert not now included in the existing area; (2) grazing and mining activities are not compatible with objectives to preserve the biological values of the desert and should be eliminated; (3) the present name is misleading and should be changed to one that is more descriptive of the area; and (4) the area should be raised to the status of a National Park.

Indicative of this interest is the fact that the Advisory Board on National Parks, Historic Sites, Buildings, and Monuments, at its 46th meeting, April 30-May 3, 1962, urged the Secretary of the Interior to take positive steps to prevent further damage to the Monument from mining activities.

Preliminary analysis of the mining problem indicated the need for a much broader study covering also the equally serious grazing problem and a complete reevaluation of the purpose and mission of the Monument. This report is a result of this broader study.

Acknowledgments

The report is based upon investigations made by National Park Service staff members of the Southwest Regional Office and Organ Pipe Cactus National Monument and by Mr. Weldon F. Heald, Departmental Consultant and well-known conservationist of Tucson, Arizona, who wrote the major portion of the report. Mr. Norman Simmons, Assistant Manager of the Cabeza Prieta Game Range for the Bureau of Sport Fisheries and Wildlife, provided much valuable information and served as guide throughout the Range.

Several scientists at the University of Arizona, Tucson generously contributed data and judgments: Dr. Charles H. Lowe, Jr. served as a consultant on many of the complex biological and ecological aspects of the report. Dr. James R. Hastings, Dr. Paul S. Martin, Dr. Terah L. Smiley, Dr. John L. Harshbarger, and Dr. Richard S. Felger provided valuable background information. Dr. Robert T. Burgess, North Dakota State University, prepared a special analysis relating to his recent studies of saguaro reproduction at Tonto National Monument.

None of these scientists has had an opportunity to review the manner in which the information they have provided has been used. The assistance of these and other cooperating individuals has contributed substantially to the efforts of the Service in preparation of this report, and is greatly appreciated.

DESCRIPTION

The Study Area

As shown on the accompanying map, the study area encompassed by this report consists of the Organ Pipe Cactus National Monument in southern Arizona, the Pinacate volcanic field in Mexico, and all of the Cabeza Prieta Game Range except a small portion lying east of the Growler Mountains. This latter area was excluded because of military radar use of Childs Mountain, possible mineralization, and because it contains part of the only section of the Game Range on which there is an existing grazing allotment. The study area also includes a 80,000-acre extension west of the Game Range which contains the significantly important Tinajas Altas Mountains.

The 330,874-acre Organ Pipe Cactus National Monument was created in 1937 by Presidential Proclamation to protect and preserve especially fine examples of Sonoran Desert vegetation, wildlife, and scenery. It is, in fact, a veritable natural desert botanical garden and wildlife habitat, and exhibits a biological cross-section of the entire region. In addition, the Monument includes two species of columnar cactus -- the organ pipe and senita -- which are fairly common in Mexico, but extremely rare north of the border.

Adjoining the National Monument on the west and north and, like the Monument, lying along the Mexican border, the Cabeza Prieta Game Range is an area larger than the State of Rhode Island without a single permanent inhabitant. Its size is more than 1,340 square miles, or about 860,000 acres. No roads passable with standard cars traverse its wide-sweeping valleys and rugged mountains, and the few faint traces of man's past activities are swallowed up in the immensity of the stark desert wilderness. Furthermore, at the present time all trespass is forbidden, and visitors must obtain special permits to enter.

Administered by the Bureau of Sport Fisheries and Wildlife, the Game Range was established in 1939 primarily for the protection of desert bighorn sheep. It also provides an undisturbed habitat for a remnant population of pronghorn, commonly known as antelope; the collared peccary, a wild pig locally called javelina; gambels quail; and white-winged dove. Travel in the area is severely restricted, as it is within a military aerial target range. Although there is no air-to-ground firing, occasional stray shells and falling targets are considered to be potential dangers.

Together the National Monument and Game Range occupy only about one-third of a vast, sparsely settled and mostly undeveloped arid

region north of the border, which is continued southward by an equally large area in Mexico -- altogether some 11,000 to 12,000 square miles.

Adjacent to the study area on the east is the Papago Indian Reservation, and to the north stretch roadless, almost uninhabited public domain lands to transcontinental Interstate Highway 8. West are the "Medanos," or sand dunes of the Yuma Desert, which spread in golden waves almost to the Colorado River, while to the south, in the Mexican State of Sonora, lies the famed Pinacate region, one of the roughest and most remarkable volcanic fields on the continent.

There are only two communities of any consequence in the vicinity of the study area. These are the Arizona copper-mining town of Ajo, with a population of 7,049, a few miles north of the National Monument, and Sonoyta, a Mexican border settlement with 1,275 inhabitants, located just south of the Monument. But the area is easily accessible by car. A paved highway reaches Ajo from Tucson, to the east, and another leaves Interstate 8 at Gila Bend and goes south to Ajo and through Organ Pipe Cactus National Monument to the popular Mexican sport-fishing resort of Punta Penasco, on the Gulf of California. Also, following the border westward from Sonoyta is paved Mexico Federal Highway 2, which connects with through routes to Yuma and California points. South of Sonoyta the same road continues to Mexico's west coast Federal Highway.

The Sonoran Desert

The Cabeza Prieta Game Range and Organ Pipe Cactus National Monument, which make up the major portion of the study area, are particularly important because they represent the last sizeable expanse of relatively unspoiled Sonoran Desert remaining in the United States.

Except for the extensive Great Basin sector, the so-called Great American Desert is divided into the Chihuahuan Desert in the Mexican State of Chihuahua, west Texas, and part of New Mexico; the Mohave Desert in Southern California and Nevada; and the Sonoran Desert in the Mexican States of Sonora and Baja California and in southern Arizona and California. Each is distinguished by botanical, zoological, and climatic differences.

The Mohave Desert contains principally vast open stands of low shrubs, tall yucca at higher elevations and, in contrast to the Sonoran, but few trees. The Chihuahuan Desert is characterized by low shrubs, low-growing succulents such as pricklypear, cholla, and small barrel cactus and yuccas; small trees are confined to drainageways. The Sonoran Desert, lying between these provinces, is by far the richest in number and variety of life forms and in diversity of biotic communities. It contains large numbers of both evergreen

ESERT AREAS OF
NORTH AMERICA

and deciduous shrubs, many species of small trees, and a great variety of succulents -- notably cactus. It is known for its unusual variety of mammals, reptiles, and birds.

Of these three deserts, the Sonoran is without doubt the most unusual and distinctive. One of the great biotic provinces of North America, it stretches northward from the vicinity of Guaymas, Sonora, 500 miles to beyond Phoenix, Arizona, and is more than 300 miles across at its widest point. Extremely dry, the region throughout is searing hot in summer, but enjoys one of the world's pleasantest climates from November to April. Annual precipitation averages from 2 to 10 inches and a brilliant sun shines the year round 80 percent of all daylight hours. Although there are barren wastelands of sand and naked rock, in general the country supports a surprising wealth of varied vegetation and wildlife. In fact, it demonstrates a complex ecological balance that has produced an individual environment different from any other on earth.

Organ Pipe Cactus National Monument and the Cabeza Prieta Game Range lie wholly within the Sonoran Desert. However, the western part of the Range begins to display botanical and zoological indicators that represent a transition between the Sonoran and Mohave Deserts. Ecologists describe this mingling in the west half of the Game Range as


SONORAN DESERT
0 20 40 100
Scale in Miles
Flagstaff
66
89
79
66
CALIFORNIA
ARIZONA
Phoenix
San Diego
Gila Bend
Ajo
Tucson
10
80
CABEZA PRIETA GAME RANGE
ORGAN PIPE CACTUS NAT'L MONUMENT
Punto Peñasco
UNITED STATES
MEXICO
PACIFIC OCEAN
BAJA CALIFORNIA
GULF OF CALIFORNIA
SONORA
PROPOSED
SONORAN DESERT
NATIONAL PARK
ARIZONA
VICINITY MAP

"an interesting interdigitating mosaic pattern of zones influenced by various physical and climatic factors." Examples are the changes from east to west in species of creosotebush and bursage, which represent the transition from one biotic province to another.

The study area is also at the northern limits of several predominantly Mexican plants and animals, such as the organ pipe and senita cactuses, the elephant tree, and the peccary. Within the Monument and Game Range are more than 400 botanical species, representing some 75 families; and the fauna includes 34 species of mammals, over 128 species of birds, 16 of reptiles, and 1 rare fish. The last is the inch-long, shiny blue Percy minnow or pupfish, found only in the pond at Quitobaquito Springs in the southern part of the Monument, and one other place in Arizona.

Geographically and geologically Organ Pipe Cactus National Monument and Cabeza Prieta Game Range are a part of the Basin and Range province, which stretches from southern Oregon to west Texas, and includes the entire intermontane region between the Wasatch Mountains in Utah and California's Sierra Nevada. The province as a whole is characterized by abrupt, long but relatively narrow, north-and-south-trending mountain ranges separated by broad valleys and plains. Due to the general aridity, much of the drainage water

never reaches the Pacific, but collects and evaporates in shallow intermittent lakes, called playas. Most of them have no outlets and at the present time are usually dry expanses of hard-packed sand, silt, or alkali, although during the Pleistocene pluvial epoch they contained permanent water and many drained to the ocean.

The study area is an almost perfect type-example of basin-and-range topography. From the eastern boundary of the Monument to just beyond the western end of Cabeza Prieta, seven mountain ranges roughly parallel each other in a northwest-to-southeast direction. Between them are six valleys, in places so wide as to resemble nearly level plains. There are also groups of low hills and isolated buttes and mesas scattered here and there. Except in parts of the extreme south, the valleys slope gently northward to the Gila River.

The mountain ranges are the most prominent aspect of every view, in spite of the fact that they occupy a relatively small percentage of the total area. This is not evident from the ground, but on maps and from the air these ranges appear as secondary features in a vast expanse of flat desert. Their length varies from 15 to over 40 miles, but they are seldom more than 2 miles wide, and rise from valleys on both sides to single linear crests of peaks and notches

which vary little in altitude for considerable distances. Steep, plunging canyons gouge the mountains' rugged flanks, while cliffs and knife-edge ridges are common. In fact, these desert ranges seem like the skeletons of mountains whose naked ribs stand out in barren savagery, unrelieved by the softening effect of vegetation. Color alone gives them interest and variety, and they glow with white, grey, yellow, sepia, brown, and chocolate in the brilliant southwestern sunshine.

Moreover, the mountains are surprisingly impressive considering their moderate altitudes. Highest is Ajo Peak, 4,770 feet, in the Ajo Range, which forms the eastern boundary of Organ Pipe Cactus National Monument. Westward, elevations are lower, the Growler Mountains having the only summits in the Game Range topping 3,000 feet. But as the valley floors vary in elevation from 600 to 1,000 feet, precipitous escarpments in excess of 2,000 feet are numerous. Without trees or noticeable vegetation to give the mountains scale, the impression is that they are twice as high as is actually the case.

The Cabeza Prieta Mountains in the western part of the Game Range differ from all the others. Consisting of a maze of canyons, peaks, and ridges, 10 miles long and 5 miles across, they contain some of the roughest country in the entire area. The refuge gets its name

from lava-capped Cabeza Prieta Peak, 2,650 feet, near the south end. The Spanish meaning is "dark head." The dappled, pinto-like combination of brown volcanic rock superimposed on gleaming white granite is a spectacular feature of these mountains.

The Game Range receives considerably more precipitation than does California's Death Valley. But it rivals that world-famed dry spot in aridity, and probably has less water resources. There are no permanent streams, reliable springs are non-existent, and the playas in the lowest parts of the valleys have not held water in many years. Wells have been dug or bored in a dozen places and these supply limited amounts of water, mostly by means of windmills.

However, since prehistoric times both men and animals have taken advantage of the so-called "tinajas," translated into English as "tanks." These are natural rock basins in the mountain canyons, scooped out by centuries of violent but infrequent cloudbursts. Most of them retain some water all year. There are many in the Cabeza Prieta Game Range, but the best known are in the Tinajas Altas Mountains just outside the western boundary. The tanks were first used by the Indians and have been life savers to white travelers for nearly 400 years. The Bureau of Sport Fisheries and Wildlife has deepened several mountain tanks by constructing dams at

their lower ends, and has excavated artificial tanks in the vicinity of valley washes, which provide drinking water for wildlife and resting places for aquatic birds.

Almost every characteristic of the Sonoran Desert is represented in the Cabeza Prieta-Organ Pipe Cactus study area. Here one has an unmatched opportunity to observe the animals, birds, plants, scenery, and the results of geological forces on a grand scale in a widespread land little altered by man.

Climate

In the Southwest, temperatures drop sharply with increasing altitude, and precipitation increases. The climatic factors which produce the ecological environments typical of the Sonoran Desert extend upward in southern Arizona's highlands and mountains with diminishing effect to an elevation of 4,000 feet. Above, desert conditions are replaced by semiarid grasslands alternating with open groves and woodlands of oak, juniper, and pinyon. Elevations in the study area are too low for this transition to take place, with the exception of the Ajo Range in Organ Pipe Cactus National Monument. There, perched on the highest crests, is a small, isolated island of grassland, scattered with rare Ajo oaks and one-seed junipers.

In the lower elevational limits of the Cabeza Prieta Game Range mean annual temperatures probably do not vary by more than 6 to 8 degrees Fahrenheit from the valley floors to the mountain summits, and there is apparently little increase in precipitation. So the area is an excellent sample of unbroken Sonoran Desert having sufficient size to demonstrate its climatic characteristics without conflicting influences.

There are no official weather stations in the Game Range, although the Assistant Manager has established automatic thermometers and

rain gauges at several points. However, the year-round climate may be inferred from the National Park Service station at the Monument Headquarters and those of the United States Weather Bureau in the nearest towns. The extreme maximum and minimum temperatures ever recorded at Ajo, elevation 1,800 feet, 4 miles from the Game Range east boundary, are 115° F. and 17° F., respectively, but at Mohawk, 1,200 feet lower elevation in the Gila River valley, to the north, the figures are 126° F. and 16° F. It is probable that in the lower sun-heated canyons of the Game Range summer daytime temperatures may reach 130° F. As day and night differ by about 40° F., the minimums accompanying such highs would be in the low 90's or high 80's. Winter daytime temperatures range from 60° F. to 70° F.

Annual precipitation decreases rapidly from east to west. At Ajo the average is 9.14 inches, but the western portion of the Game Range is within the belt of least moisture in the United States, and yearly precipitation does not average more than 3.5 to 4 inches. On the other hand, evaporation rates are probably greater than 120 inches a year. Snow whitens the highest peaks of the Monument and Game Range two or three times each winter, but disappears in a few hours, and a snowfall below 2,000 feet is a very rare event.

Summer rains account for 60 to 70 percent of the total precipitation. They fall as convection showers, usually accompanied by thunder and lightning. Often reaching cloudburst proportions, these storms are mostly small in extent, moving across the country and often producing a flash flood in one creek bed and skipping the adjacent watershed entirely. However, torrential rains of short duration may be expected anywhere at any time from late June to mid-September, and they add their bit to the hazards of summer travel in the area. The transition from no water to too much water can be sudden and sometimes dangerous.

More gentle are the winter rains. They are the remnants of west coast storms which have had a large part of their moisture wrung out of them by California's mountain ramparts. If the Pacific storm track is farther south than usual, desert rains are generous. But if the annual cold-season parade of low-pressure areas passes well to the north, little moisture results. Then the winter may be almost rainless, as is normally the case in spring and fall.

This is a country of contrasts: between night and day; winter and summer; moisture and dryness. But it is above all a great natural climatic laboratory where every experiment can be clearly seen and their combined results easily studied.

AREA RESOURCES AND SIGNIFICANCE

Plants and Animals

The rich and varied vegetation is perhaps the most striking feature of the Sonoran Desert -- certainly it is the most obvious and of most interest to the visitor. Within the study area three biological subdivisions of the Sonoran meet and blend together. As a result there is a great variety of plant and animal life, including many species rarely found anywhere else in this country.

Special symbol of the Sonoran Desert is the saguaro; it grows naturally nowhere else. This gigantic single-stemmed cactus, standing 10 to 50 feet high, forms weird open "forests" of gaunt, fluted, olive-green columns, often with fantastically extended arms. In many places the saguaros spread over hill, valley, and mountainside in groups, ranks, and clusters, making as uncanny a landscape as can be seen anywhere.

But perhaps the most remarkable characteristics of the saguaros is that they dominate a little world of their own, which has a particular animal, bird, and plant life. Many species are unique to the Sonoran Desert and are found nowhere else, and the ranges of some are almost identical to that of the saguaro. The local Indian cultures, from the dim past to the present time, are also based upon the saguaro, and the primitive native way of life still

persists little changed, with religion, customs, and well-being directly influenced by this giant cactus. The Indians make the fruit into food and drink; use the ribs for their huts and ramadas; and weave saguaro fiber baskets and drinking vessels. So important is the saguaro to the aboriginal inhabitants, that they celebrate their New Year when the fruit ripens in May.

However, the whole Sonoran Desert is preeminently a land of cactuses, and scattered among the giants are dozens of other species, as well as a surprising variety of other plants, mostly bristling, spiny, or spiked. Besides the saguaro, organpipe, and senita, there are the barbed barrel cactus and night-blooming cereus, the many-branched tree cholla and fuzzy teddy bear cholla, pricklypear, rainbow, fishhook, and a host of ground-hugging cactuses.

Also numerous are trees and shrubs, such as the green-trunked paloverde, the whiplike ocotillo, the leafless crucifixionthorn, the fat-trunked elephanttree, creosotebush, centuryplant, mesquite, ironwood, catclaw acacia, bursage, smoketree, desertwillow, and several varieties of yucca.

In early spring, especially after generous winter rains, the desert stages a gaudy flower show. In places valleys and hillsides are spread with rainbow-hued carpets of blooms. Then, if summer thunder showers are plentiful, the land comes to vigorous life again with a second wildflower exhibit and scattered patches of green grass,

in places almost as lush as the Vermont countryside. Prominent spring and summer flowers are the Mexican goldpoppy, magenta, owl-clover, blue lupine, and bright orange mallow.

The Sonoran Desert teems with animal life, from earthbound insects, mammals, and reptiles, to soaring eagles, hawks, and buzzards high in the sky. Familiar birds include the roadrunner, gila woodpecker, cactus wren, gilded flicker, inca dove, and elf owl. In addition to pronghorns, bighorn sheep, and peccaries, the larger animals include the ubiquitous coyotes, as well as cougars, bobcats, badgers, foxes, and mule deer. But perhaps most fascinating is the busy life of the smaller creatures who run, hop, crawl, burrow, and climb in well-adjusted association with the desert vegetation. Nowhere can be found better examples of adaptation to an austere environment of extreme aridity. Every living thing is provided with special ways and means of survival, and this almost waterless community of plants and animals induces a feeling of reverent awe for Nature's infinite capacity.

All in all, the Sonoran Desert is a place of beauty, scientific interest, and relaxation. It is a priceless legacy from our original natural heritage and, as such, is of national significance. As much as possible of what remains in a near-primitive condition should be preserved intact for the enjoyment, education, and inspiration of the crowded generations to come.

Geology

The broad landscape of the study area is of comparatively recent origin. However, the elements that compose it are venerable even on a geological time scale. The outline and form of the present mountains and valleys date back only a few million years, but the structural materials and chain of events which made the country what it is show a continuous tectonic history spanning at least a half-billion years, possibly twice that long. Through the ages the land periodically rose and fell, and several times was the bed of shallow seas. Mountain ranges were uplifted and eroded away. Sedimentary layers were formed from the wasted mountains, and vast amounts of molten magma were intruded beneath the earth's surface to become the basic crystalline rocks of today.

The late Tertiary Period, some 15 to 20 million years ago, was a time of widespread volcanic activity, and much of the area was buried by successive lava flows and showers of ash which filled the valleys to depths of hundreds of feet and, in places, built up veritable mountains. This tremendous overburden of volcanic material came from no single center, but was poured forth from dozens of vents throughout the area. By the end of the Tertiary the subterranean fires died, the final lava flows hardened into andesite, rhyolite, and basalt, and the stage was set for the modern geological drama.

Its first act began with orogenic upheavals, and the present fault-block ranges were slowly uplifted along northwest-southeast trending zones of weakness. As they rose they carried the volcanic covering up with them. This lava cap can still be seen atop the crests and on the flanks of the Ajo Range and the Puerto Blanco Mountains in Organ Pipe Cactus National Monument, and the Growler and Cabeza Prieta Mountains in the Game Range. Other indications of Tertiary volcanism are lava plugs, buttes, and mesas throughout the area. However, the Granite and Mohawk Mountains and the Sierra Pinta in the Game Range have lost their lava overburden and now consist almost entirely of the original underlying granites, schists, and gneiss.

Little sedimentary rock remains, but one strikingly eroded formation of reddish sandstone rises to the east of Tule Well, near the Mexican border. The valleys, and the bajadas leading up to the bases of the mountains, consist of outwash alluvium and detritus to an unknown depth. But whatever the thickness, it is impressive that such a tremendous amount of material can have come from mountain ranges of such limited extent and modest altitude. In fact, the results of past and present geological forces are such prominent features of the area that even the layman finds them challenging subject for speculation.

The last act, perhaps most dramatic of all because so recent, was the pouring forth of the Pinacate volcanic field, over the line in Mexico. It would be safe to conjecture that if the Gadsden Purchase had included more land to the south in the United States, the Pinacate region today would be one of our most remarkable and best known National Parks. Here "hell boiled over," not once, but countless times. Centered in the round-topped Sierra Pinacate, 3,957 feet elevation, remnant of a larger and higher volcano, an apron of multiple lava flows spreads for many miles in every direction. The northern edge spills northward over the border into the Cabeza Prieta Game Range and, to the west, the lavas are buried beneath the great sand dunes which extend along the Sonora shore of the Gulf of California for more than 100 miles. Incredibly rough, barren, and desolate, the dark, scabrous expanse is punctuated by hundreds of cones of every size and age. Some are battered and worn, others fresh as if they had erupted the day before. Almost every kind of volcanic phenomenon known on earth can be found here.

But the most spectacular features of the Pinacate region are the nine gigantic calderas directly incised without cones in the peripheral lavas to the north and northwest. Largest are MacDougal

Crater, Cerro Colorado, and Crater Elegante. The last is nearly circular, measuring approximately 4,800 feet in diameter, and about 700 feet deep.

The first major activity in the Pinacate volcanic field occurred at the beginning of the Pleistocene Epoch, perhaps more than a million years ago. The last eruption, probably at Cerro Colorado, dates back only about 1,000 years, plus or minus a few hundred. During the region's short recorded history Pinacate has been quiescent, but it cannot be assumed that the field is dead for all time.

Myriads of diverse forces are continually shaping the landscape day after day. Their actions are, of course, generally far too slow to be measured by human clocks, but at any time the curtain may rise on another act in the everlasting geologic drama.

Prehistory and History

For thousands of years southern Arizona was inhabited by ancestors of the present-day Indians. Although the climate was considerably cooler and more moist than it is today, there is no evidence that these early Indians made permanent settlements within the study area.

In later times, when conditions were much as they are now, the territory was the home of a few families of seminomadic Indians, known as the Sand Papagos. These primitive people eked out a meager living in the harsh desert environment by hunting bighorn sheep and subsisting on what other food they could find -- mainly cactus fruit and mesquite beans.

Well-worn trails, still clearly visible in many places, cross the study area from southwest to northeast. These were part of a general Indian trade route from the Gulf of California into the interior. Salt and sea shells from the Gulf were particularly popular items of barter with these people, and were eagerly sought by inland tribes. Along the trails are the remains of "sleeping circles" outlined by boulders, stone shelters, metates, petroglyphs, and other relics of a vanished culture. A popular resting place on one of these routes was at the present Charlie Bell Well, then

presumably a copious spring, near the northeastern corner of the Game Range. There, scores of petroglyphs can be seen on the rocks scattered over a hillside above the ancient camp. The much larger spring at Quitobaquito in the southwest corner of the Monument was an equally important stopping place on another well-used trail.

When recorded history began with the coming of the Spaniards some four centuries ago, the Growler Mountains were the dividing line between the Yuma Indians on the west and the Papagos to the east and southeast. The latter were finally awarded a part of their ancestral homeland in perpetuity by the United States Government in 1916, with the establishment of the Papago Indian Reservation. Containing approximately 2,775,000 acres, it is the second largest Indian Reservation in the country and is now inhabited by about 10,000 Papagos. Their principal basis of economy is cattle raising. The tribe is an interesting example of acculteration, combining both the old and the new. These Indians have adopted what they want from modern civilization, and are largely Roman Catholics, but they prefer to live in native-style villages and rancherias, and stoutly cling to their time-honored way of life.

The first white man to enter the region was the Spanish explorer Melchior Diaz, who crossed it in 1540 on his way to the mouth of

the Colorado River. A century and a half later the country was often traversed by the famed Jesuit missionary priest Father Eusebio Kino, who was one of the Southwest's outstanding explorers and a pioneer emissary of European civilization to its native population. He established one of his many Indian missions at Sonoyta in 1699, and his meticulous journals record stops at Quitobaquito, Heart Tank, Cabeza Prieta Tank, Tinajas Altas, and other places in the study area. Father Kino is credited with making the first maps of Pimeria Alta, the name then applied to southern Arizona and northern Sonora, and with the discovery that California is not an island.

In 1774 the indomitable Franciscan Padre Francisco Garces and Captain Juan Bautista de Anza passed through the southern portion of the study area. Two years later they repeated the journey accompanied by more than 200 colonists for the founding of San Francisco. Their route later came to be known as El Camino del Diablo, or the "Devil's Highway," because of the great numbers of humans and animals who perished along it from fatigue and lack of water. Many gold seekers followed this hellish track westward in the late 1840's and 1850's and it is said that at least 400 of

them died along the way. All this region was Spanish until Mexico won its independance in 1822. Then, with the Gadsden Purchase of 1854, the United States acquired 45,535 square miles of Mexican territory, and the present international boundary was established.

In spite of its early exploration, the country was too inhospitable to invite settlement, and it remained largely an unpopulated desert. The entire region has been thoroughly prospected, but no rich strikes were ever made with the exception of the great copper deposits at Ajo. Spaniards worked mines in the vicinity as early as 1750, but intensive development did not begin until 1854. Today the Phelps Dodge Corporation conducts a large open-pit operation and smelter, and the Ajo area is one of the most important mining districts in the Southwest.

Unquestionably few sections of the United States have had such a long human history, yet still remain so remote, sparsely settled, and little known. This, of course, contributes greatly to the region's attractiveness, and should be taken into account in any discussion of its future status. Such intangible considerations should also be a predominant factor in planning for public use of the area.

SUITABILITY AND FEASIBILITY

National Park Qualifications

The study area contains the finest, largest, and most interesting example of unaltered Sonoran Desert remaining in the United States. The variety and abundance of plant and associated animal life forms, in a setting of dramatically spectacular landforms, provide scenic, scientific, and esthetic qualities of an extremely high order.

Geologically, no better type locality of the basin-and-range topography can be found. This, combined with the awe-inspiring Pinacate volcanic display, gives the area geologic interest of superlative rank.

Archeologic and historic aspects, although involving relatively small numbers of humans, are of notable interest because of the adverse conditions under which their stories unfolded.

The entire study area forms a comprehensive whole. Each of the three major sections -- the existing Monument, the Game Range, and the Pinacate area of Mexico -- includes significant features not found in the other sections. Together they comprise an integrated unit embracing the convergent centers of all three of the recognized subprovinces of Sonoran Desert represented in the United States. In

addition, this unit is of sufficient size as to permit unique biological communities to be relatively undisturbed and self-maintaining.

In discussing the suitability of the area for preservation, it should be pointed out that the association of features represented here is not duplicated at Saguaro, Death Valley, or Joshua Tree National Monuments, at Big Bend or Carlsbad Caverns National Parks, or, for that matter, in any other area preserved by Federal, state, or private agencies.

The study area has existing convenient access by scenic routes to the National Monument sector, and comparable access could easily be developed to the Game Range area from U.S. 80 (Interstate 8) in the vicinity of Yuma. With such approaches at both ends of the study area, good possibilities exist for linking the component sections together with a circulatory road system. Except for the question of establishing another port of entry from Mexico into the United States, Mexican Route 2, which crosses the northern fringe of the Pinacate volcanic field, would also provide another approach to the Monument-Game Range complex almost anywhere along its southern boundary.

The area enjoys a delightful 6-month winter season of low humidity and bright sunshine, and with its scenic, scientific, and historic attributes, the opportunities for outdoor recreation are outstanding.

From analysis of all these factors, it can only be concluded that the entire area is eminently qualified for National -- if not International -- Park status. In addition, it is singularly adaptable to development as a desert wilderness along the lines envisioned by the National Wilderness Preservation Act of 1964. Under this concept, access roads, visitor centers, and other public-use facilities would be confined to limited sites and narrow corridors with the bulk of the area carefully preserved in an unspoiled wilderness condition.

Recreation Demands

In this part of Arizona, recreation is a form of land use that has great economic promise. The study area is located within an easy day's travel of a great segment of the Nation's population. The southern California area with 10 million people and the Phoenix-Tucson area with close to a million people are the principal sources of recreation users. These regions are growing at fully three times the national rate of population increase and this trend is expected to continue. In addition, ever-increasing numbers of winter vacationists and retired people come from the cold areas of the Nation seeking a warm, dry climate in natural surroundings.

Visitor use at Organ Pipe Cactus National Monument, which has grown from 60,800 in 1944 to 324,700 in 1964, is strongly indicative of the expanding importance of recreation travel in this section of the country. Increased mobility and leisure time, particularly that brought about by earlier and more complete retirement coverage, point to an even greater demand for outdoor recreation in the future. An enlarged National Park unit in the Sonoran Desert province would fulfill a vital role in meeting this demand, as well as contributing significantly to the economy of the region.

Potential for Research

The whole of the study area is also an integrated unit as far as scientific research is concerned. The subtle ecological shifts occurring in the arid Southwest are of great interest to scientists in a variety of disciplines. These changes are also of genuine concern to cattlemen and farmers as well as Federal and state agencies administering lands in this section of the country, and a coordinated research plan covering the entire area would be of great value.

Historic photographs, when compared to current retakes of the same scene, reveal striking alterations in vegetative cover since the late 1800's. For example, the lower edge of the scrub oak in some places has moved upslope some 400 feet in only 80 years. Saguaro cactus is dying out in places. Mesquite is invading what was once grassland. These reflect deep-seated processes with little-understood but probably significant and far-reaching consequences for man.

Scientists interested in this problem of change variously attribute it to climate, disease, predator control, fire control, and over-grazing. Recognizing the difficulty of identifying the changes

resulting from man's land-use practices in contrast to those naturally caused, these scientists are urging the designation for research and control purposes of a large, comprehensive, unmodified study area which would comprise a substantial representation of the major subprovinces of the Sonoran Desert in its natural state.

The study area would constitute such a comprehensive unit, and the uniform and coordinated management of the entire area would increase the effectiveness of an integrated research program. This valuable purpose would be fully compatible with designation and management of the area as a National Park.

ADVERSE LAND USES

Threats to Park Resources

The integrity of a significant portion of the study area is greatly endangered. This is a result of grazing and mining activities which are presently authorized in the existing Organ Pipe Cactus National Monument.

Although the grazing resource in the Monument is adjudged by ecologists to be of marginal value, cattle raising has been carried on, presumably at a profit, since around 1919. When the Monument was created in 1937, Mr. Robert Gray and his three sons were issued a permit which provided that the Gray partnership, during the lifetime of the four individuals, could continue grazing 1,050 head of cattle on accessible lands within the boundaries. The three sons survive. One of them owns 157.67 acres of patented land and leases two sections of State land, all within the Monument.

There is clear and long-standing evidence that grazing is a critical factor in many of the dramatic vegetational changes that are taking place in the Sonoran Desert. Research at both Saguaro and Tonto National Monuments has shown that grazing in

these areas has had a marked decimating effect upon stands of saguaro cactus, by limiting reproduction of the species. It is reasonable to assume that the same inhibitory effect operates at Organ Pipe Cactus National Monument upon the saguaro and two other notable species of columnar cacti: organpipe and senita. Botanical authorities state that these cacti are just one class of many native plants so affected.

Opinions and inferences by recognized authorities regarding the effects of grazing upon unique vegetational types at sites well within their range of distribution suggest that such effects occurring at the outer limits of the ranges are even more severe. This is apparently the case in the National Monument. Grazing-induced changes may well be taking place in the biota which will threaten their existence and defeat the purpose for which the Monument was established.

As can be expected, grazing is heaviest in the vicinity of the watering places. Naturally these wells were located in the heavily vegetated areas and, as a result, grazing damage in these areas is serious. This is highly regrettable because these areas are of

great importance to the native wildlife and are also of the most interest to visitors.

Researchers in range management have established that an average-size cow will consume about 20 pounds of dry forage per day if available, or a total of 7,300 pounds per year.* In desert country such as this, forage is, of course, not readily available, but it would be safe to assume that a cow in the desert would consume at least one-fourth of this amount. At this conservative rate, the 1,050 head of cattle covered by the existing permit would consume nearly 1,000 tons of native vegetation per year. The situation would not be nearly so serious if this consumption were spread evenly over the entire area and if it included equal portions of all plant species. This is, of course, not the case at all, and it is inconceivable that the removal of this much highly selective vegetation each year in this area of relatively sparse plant cover would not adversely affect the important biological balance which the Monument was established to preserve.

This condition is aggravated by the fact that, like other ranchers in the desert country, the permittees have, during times of

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* Range Management Handbook, U.S. Forest Service.

drought, cut trees and burned cholla free of spines to provide stock feed.

Adverse effects are not confined to the biological values. The safety of visitors is endangered by cattle grazing under "open range" practices that extend to the unfenced road right-of-way of State Route 85 within the Monument. During the past two years, car-cow accidents have averaged 25 per year; in 1963 many people were injured and one person was killed.

Nuisance factors incident to grazing include intrusion of thirsty cattle into developed areas such as the visitor center grounds, campgrounds, and residential areas where they inconvenience visitors and damage facilities to such an extent that fencing at Government expense is necessary. Dead cattle are seen at times along the road and have polluted water holes. In addition, grazing is a source of embarrassment to the Service because visitors question the propriety of allowing cattle in a Monument which was established primarily to preserve natural biological values.

At the present time there is no grazing in the Cabeza Prieta Game Range except for one legal allotment in the eastern end in the

vicinity of Ajo. Part of this lies in the small segment of the Range that was excluded from the study area. Prior to February 1965 there was widespread trespass grazing on the eastern portion of the Range by the Gray partnership, but this has now been terminated by order of a Federal judge as a result of suit brought by the Bureau of Sport Fisheries and Wildlife.

Prospecting and mining are also permitted in Organ Pipe Cactus National Monument. This marked departure from the normal policy concerning mining in the National Park System is the result of an act of Congress -- of October 27, 1941 (55 Stat. 745) -- which specifically authorized prospecting and mining in the Monument. In part, this was brought about by the nationwide search for minerals in connection with the national defense emergency at the time.

To most people, "prospecting in the desert" brings to mind a lonely, bearded old man with a pick and shovel and his trusty burro. If this were the case, prospecting on the Monument would not be much of a problem. However, today's methods involve bulldozers, drag lines, power shovels, earth movers, drilling rigs, dynamite, and innumerable trucks. In addition to damage on the

claim itself, rather substantial roads are dozed out. When the claim is abandoned for lack of a find, as is usually the case, the scars remain, along with the trash, the tailings, and the debris generated by the effort. In this fragile desert country, the scars do not heal and serious erosion invariably results.

Geological investigations in the Monument reveal that only about one-tenth of the area is mineralized, and there the deposits are sparse and occur chiefly in small, irregular veins. Principal commercial ores are low-grade copper and modest amounts of gold and silver. No mineralization occurs in the area resembling in any respect the large copper deposit at the New Cornelia Mine near Ajo, 33 miles north of the Monument headquarters. This find is singular. In general the occurrence of commercially significant metallic or nonmetallic deposits in this part of Arizona is low in comparison to that in the more mountainous sections of the State. A known possibility within the Monument is at Copper Hill. Since 1941 three major companies have explored there by geophysical techniques and core drilling to a depth of 2,000 feet, but apparently the findings are not promising, as the companies have not exercised their options.

Although prospecting has been permitted in the Monument for more than 23 years, there has not been a single mining venture that has proven profitable. The actual record of negative showings is much longer, for despite intensive prospecting over the past 200 years, no significant mineral discovery has ever been made in the Monument area. Yet the embers of hope are never quite extinguished, and the practice of prospecting, with all its destructive effects, continues on as long as it is legally authorized. The total number of claims is unknown, but none is being actively operated at present. From the foregoing, it can be honestly concluded that the complete elimination of prospecting and mining from the National Monument would probably cause no economic hardship to individuals, companies, or the region.

As perhaps no other form of land use is more destructive to the natural values of the National Monument, every effort should be made to extinguish existing claims and terminate prospecting at the earliest possible time.

Military Use of the Game Range

An important factor affecting the feasibility of an expanded park area concerns the military use of the Cabeza Prieta Game Range. Almost all of it is overlapped by the Williams Bombing and Gunnery Range, and at the present time the air space over most of this portion of the study area is used by the Air Force and Marine Corps for air-to-air gunnery practice and missile firings. Although there are no facilities or targets on the ground and no air-to-ground firings, there is danger of falling hardware and spent projectiles. As a result, the area is closed to public use of any kind except on most weekends and, with special permission, during the brief periods when it is not being used for military purposes.

Although no formal inquiries have been made to the military authorities, available information from local sources strongly indicates that the Defense establishment would be extremely reluctant to relinquish any part of this air space, which currently involves an area three times as large as the Game Range. In fact, it is reported that additional space is being sought.

The apparent hopelessness of the outlook, however, should be countered by recognizing that weaponry techniques and concepts

are changing rapidly, and the possibility cannot be dismissed that the existing pattern of military use over the Cabeza Prieta Game Range could become obsolete. Moreover, there is precedent for the abandonment of Defense use of an area brought into the National Park System -- as at Padre Island, Texas, parts of which were formerly used as naval air target ranges. Eventually the gunnery purposes to which the Game Range and adjacent lands are subjected might just as well be accomplished over some sector of the Pacific Ocean. At any rate, these are matters which should be weighed in evaluating the feasibility of the National Park proposal.

On the bright side, the Game Range under its present joint use for wildlife and military purposes, to the exclusion of the public, is being afforded a high degree of protection. Its ecological integrity and natural condition are almost perfectly preserved. This is indeed fortunate, because such an inviolate status constitutes a kind of "deep freeze" which will keep the area intact, to be considered for National Park purposes if and when military use is terminated or modified for any reason.

CONCLUSIONS

Careful analysis of the many factors involved supports the conclusion that Organ Pipe Cactus National Monument, the Cabeza Prieta Game Range, and the contiguous Pinacate volcanic field in Mexico constitute an integrated unit of unspoiled Sonoran Desert. The biological, geological, historical, scenic, and esthetic values of the entire study area are of such outstanding significance and their recreation potential so high as to fully warrant whatever steps are necessary to provide for both adequately preserving the area and making it available for public use.

The logical and desirable solution would be to combine the Monument and Game Range to form the Sonoran Desert National Park. The accompanying map shows the boundaries of the proposed Sonoran Desert National Park. With elimination of the small segment of the eastern end of the Game Range and addition of the 80,000-acre extension on its western end, the total size of the Park would be approximately 1,242,000 acres.

This action, of course, would be completely contingent upon termination of military use of the Game Range, which now precludes public use, and elimination of grazing and mining activities in the Monument which seriously threaten the very values which need to be preserved. As long as military activities prevent public use of the Game Range, no valid purpose would be served by changing its present status. Nevertheless, the significant potential of the area for public benefit cannot be overlooked, and an interest in the area for park purposes should be put on record. As soon as the situation changes so as to permit safe public access and use, the area should be considered for addition to the existing Organ Pipe Cactus area under National Park Service administration.

The entire Monument-Game Range complex is particularly suited for management in conformance with the National Wilderness Preservation System concept as outlined by the Congress in the Wilderness Act of September 3, 1964. Except for requisite developed areas and roadways, the proposed National Park in its entirety could be managed as desert wilderness.

In recognition of the fact that grazing and mining activities are incompatible with an attempt to preserve the fragile and delicately

balanced biological values of a desert, these two uses should be eliminated as soon as possible from the National Monument, regardless of any proposal affecting its status. In the aforementioned Wilderness Act, Congress provided that prospecting and mining would be permitted to continue in a designated area for a period of nearly 20 years following enactment. This was based on the concept that 20 years is a sufficiently long time to insure that all valuable minerals in the area would be located and legitimate claims established. In the case of Organ Pipe Cactus National Monument, such activities have now been in force for more than 23 years after its establishment. In the circumstances, this would appear to have adequately met the needs of the mining interests as carefully considered and provided for by the Congress. Therefore, mining, as well as grazing, could justifiably be terminated without delay.

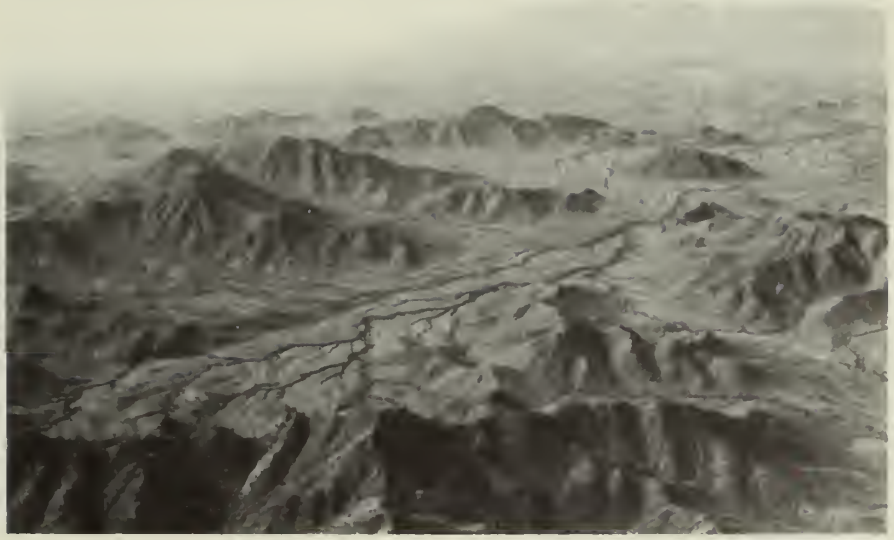
Organ Pipe Cactus National Monument contains features of sufficient significance to warrant National Park status even without the addition of the Game Range. With the elimination of grazing and mining, it is recommended that at least this area be redesignated as the Sonoran Desert National Park. If grazing and mining cannot be eliminate or phased out, there is no point in changing the status of the Monument at the present time.

1. Scenic drive in Organ Pipe Cactus National Monument. Saguaro and organ pipe cactus in foreground, with Ajo Mountains in the distance.

2. Cabeza Prieta Peak from the north near west end of Cabeza Prieta Game Range.

3. Ajo Range from the north. Montezuma Head left of center. Extreme eastern boundary of Organ Pipe Cactus National Monument.

4. Tule Mountains near westernmost portion of Cabeza Prieta Game Range. Note dip of fault blocks. Compare these granitic mountains with volcanic mountains shown above.



5. Southwest across Agua Dulce Mountains to distant Pinacate Peak in Mexico.

6. Volcanic block in Growler Valley. Only the tip remains unburied by the extensive bajada.

7. Prehistoric petroglyphs on basalt boulders near Charley Bell Well.

8. Historic Heart Tank in the Sierra Pinta. Members of study team standing on concrete rim constructed by Bureau of Sport Fisheries and Wildlife to enlarge storage capacity of the natural catch basin.

9. The historically important Camino del Diablo in the Sierra Tuseral.

10. One of many graves to be seen along the historic trails through the study area.

11. Looking southwest across the Cabeza Prieta Mountains. Lava-capped Cabeza Prieta Peak to left of center. Cabeza Prieta Tanks just below center. Gila Mountains in the distance.

12. West across Gila Mountains. Tinajas Altas Mountains on left. Sand dunes near Gulf of Lower California in the distance.

13. West over Sykes Crater in Pinacate volcanic field in Mexico. MacDougal Crater in right middle distance. Sand dune area near Gulf of Lower California in far distance.

14. Southeast over Sykes Crater. Pinacate Peak just out of picture in right distance.

15. Silica mine, Organ Pipe Cactus National Monument, showing mining damage to vegetation and scenic values.

16. Condition of mining claims after the miners leave. Senita Pass area, Organ Pipe Cactus National Monument.

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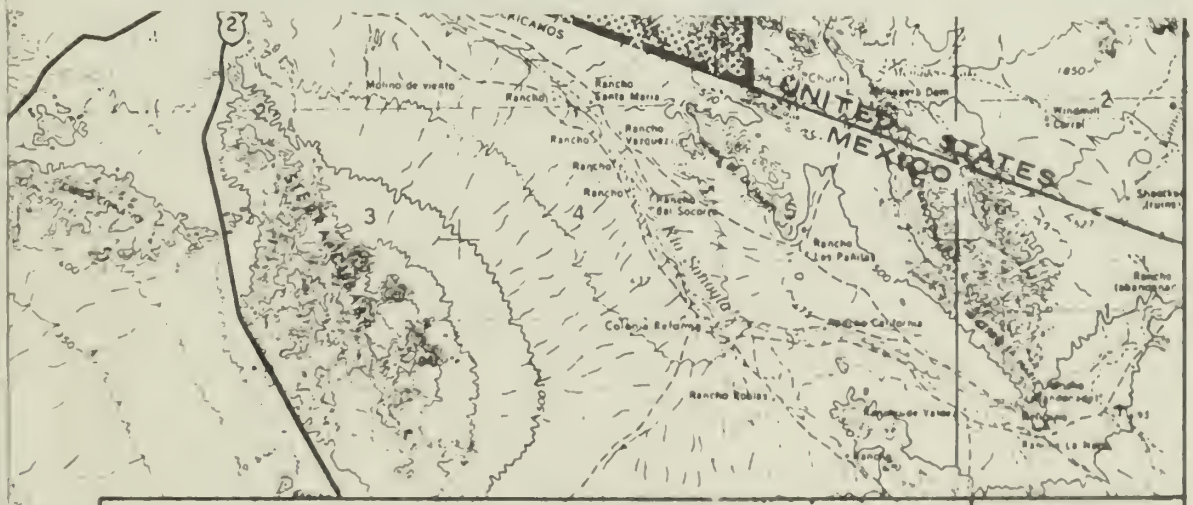

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SHEET 1 OF 1

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SONORAN DESERT NATIONAL PARK

A PROPOSAL

ARIZONA

DATE MAY 1965

PROPOSED PARK BOUNDARY

SCALE IN MILES

UNITED STATES
DEPARTMENT OF THE INTERIOR
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SONORAN DESERT NATIONAL PARK

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SHEET 1 OF 1
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